THE USE OF WOLFE GRAFTS AND TENDON-LENGTHENING IN TREATING CICATRICIAL CONTRACTURES.[1]

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WHEN the skin about joints is destroyed by burning or otherwise, the healing process is accompanied by contraction, and firm cicatricial bands are often formed which hold the members in distorted positions. The thumb may be drawn backward upon the forearm, the fingers on the palm or even on the dorsum of the hand; the forearm may be so flexed upon the arm as to be of little use; the foot may be inverted or everted so that the patient cannot walk on the plantar surface, and various other deformities may result. These cicatricial contractures are among the most annoying conditions which the surgeon has to deal with, since the force which caused the original contracture is apt to cause a new one when the first one is corrected. Many methods of treatment have been employed. A common one is to divide or dissect out the cicatricial band and hold the member in a splint during healing. If, after the dissection of the cicatrix, the edges of the skin can be brought accurately together without undue tension, the method gives a great gain; but in many instances they cannot be so brought together and the resulting contraction is almost, if not quite, as bad as that for which the operation was done. Thiersch grafts have been often used to cover the defects, but contraction still goes on. Wolfe grafts, which include the entire thickness of the skin, are also used, and the result is much better.

The six cases here cited have been treated by excision of the cicatricial tissue, the lengthening of tendons in some instances, and the use of Wolfe grafts to fill in the defect.

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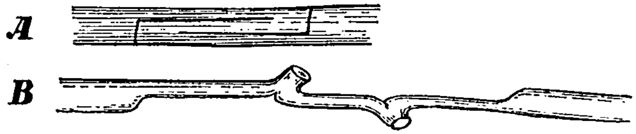
[1] Read before the New York Surgical Society, November 8, 1905.

It may not be amiss to call attention anew to the value of grafts composed of the entire thickness of the skin. Wolfe[1] of Glasgow, in 1875, used such grafts in the treatment of ectropion. Krause[2] of Altona, in 1893, presented before the German Surgical Society the results of operation in 21 cases in whom he had used grafts taken after Wolfe's method, but much larger than Wolfe had advocated and used in a much wider range of conditions. Some of his grafts were eight inches long and two and a half wide, and he used them for filling up large defects after extensive ulcers and bone necroses, after machinery accidents, face lupus, extirpation of tumors, etc. The method is very generally known by his name. In the twenty-one cases he made over one hundred grafts, and only four failed absolutely, although there were others in which there was partial failure, and he speaks of small necrotic spots as being quite common in the grafts. In his report of 1895 he emphasized the statement that these grafts were only to be employed when Thiersch grafts were not suitable. Many observers have reported on the method, among whom we may mention Henle[3] and Wagner from Von Miculicz's Klinik in Breslau, and Widman[4] from Nürnberg. The former reported fifty-one cases, among whom there were thirteen failures, eight partial failures, and thirty complete healings. The latter reported twenty-nine operations, with three absolute and two partial failures. The percentage of failures is so much greater than with the Thiersch method that it has not been popular; and Fowler probably expressed the general opinion of surgeons of the time when he stated in *Dennis' System of Surgery,* that these flaps are rarely used on account of the frequent failure of nutrition and consequent death of the flap. In the literature of the last few years one seldom sees reference to the method, although it is used by many surgeons in the few cases for whom they think it advisable. Among Krause's, Mikulicz's and Widman's cases the use of these grafts in cicatricial contractures of the finger and hand is referred to and Kennedy[5] in 1899, reports two cases in whom he used them with marked success, and a third in whom failure was due to the changing of the dressings at home by a relative of the patient. In one of his cases he used a Thiersch graft on one finger and Wolfe grafts on the other two. The Thiersch graft was followed by a severe recontracture, while the Wolfe grafts were followed by excellent results.

No report of tendon lengthening in these contractures has come to the writer's notice, although it must have been done many times. The method here used was that proposed by Hibbs[6] for lengthening the tendo Achillis.

It is more rapid than making long diagonal division and sewing the ends together, and no stitches are left in the tendon. Whether fewer adhesions result is debatable.



HIBBS' METHOD OF TENDON-LENGTHENING.

CASE HISTORIES.

Case I.—M. N., History No. 2, series 3, aged thirteen years, was admitted to St. Mary's Hospital, November 13, 1900. In early childhood she had received an injury from a pistol-hammer; this resulted in a contracture of the terminal phalanx of the right ring finger, which was drawn forward and outward and was firmly held at right angles with the rest of the finger; extension was impossible.

November 22, under ether, the contractile band was excised. The cicatricial tissue extended down to the capsule of the joint. The deep flexor tendon was so much contracted that it had to be lengthened, in order to extend the end of the distorted phalanx. The joint seemed normal. A Wolfe graft was cut from the thigh and sewed into the denuded area with fine silk stitches. Rubber tissue was applied and a firm protective dressing. This was left in place for two weeks; the outer dressing was then removed, leaving the rubber tissue in position. The dressing was changed at intervals of about a week until six weeks from the time of operation. The epidermis loosened from the flap and came away, but the true skin adhered to its position and was very firm. The motion in the joint remained good (see photograph). The

PLATE I. (CASE I.)

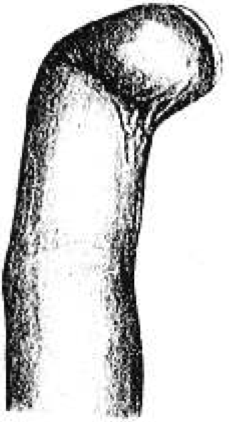


FIG. 1.—Cicatricial Contracture of Right Ring Finger; of ten years duration.

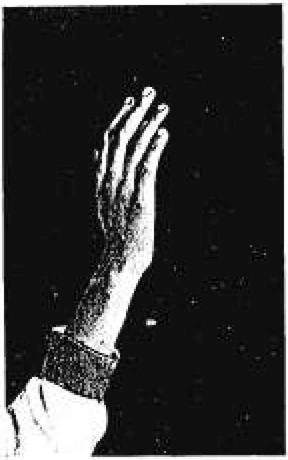


FIG. 2.—Photograph of Hand two years after operation. Posterior view.

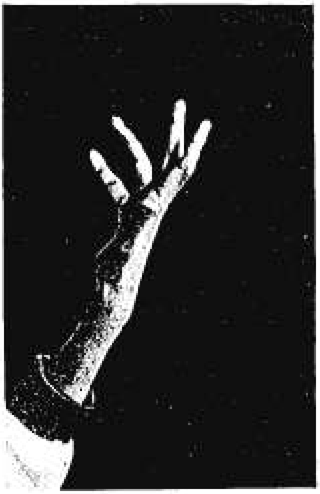


FIG. 3.—Photograph of Hand two years after operation; Lateral View; Fingers extended.

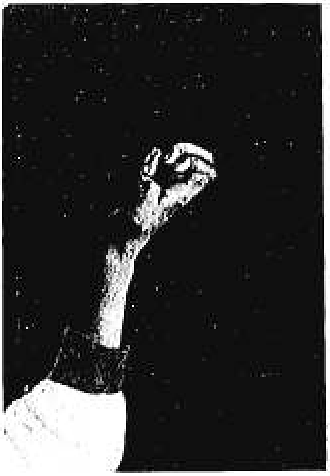


FIG. 4.—Photograph of Hand two years after operation. Fingers flexed.

PLATE II. (CASE II.)

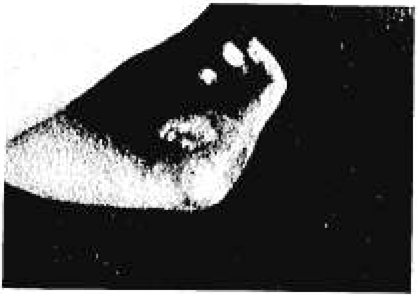
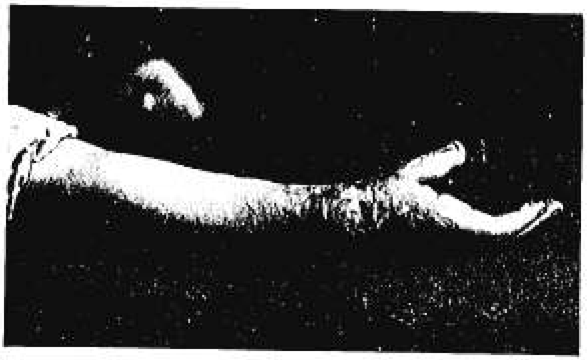
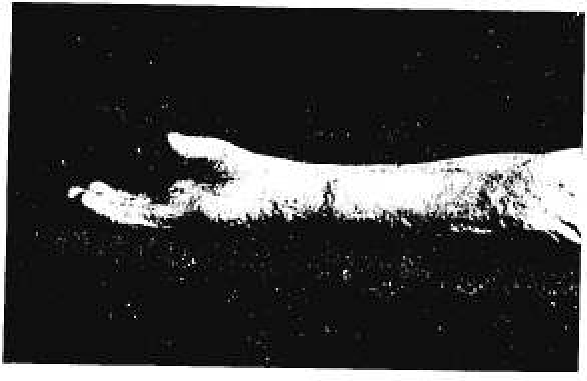


FIG. 1.—Contracture of Thumb and Hand, following Burn.





FIGS. 2 and 3.—Radial and Ulnar views of Hand, one and a-half years after the beginning of Treatment.

patient was seen two and three-quarter years after the operation; there was no return of the contracture and no loss of motion. She has since died of phthisis.

CASE II.—N. P. (History No. 1382), aged four and one-half years, admitted to St. Mary's Hospital, April 21, 1904. One year ago clothing caught fire and extensive burns of face, hand, forearm and abdomen resulted. The consequent deformity in the hand was excessive (see photograph); the thumb was drawn almost over to the flexor side of wrist and held by firm cicatricial tissue; in a similar way the little finger was drawn onto the palm, and the ring finger half way there.

April 29, 1904. The scar tissue was dissected away from the base of the thumb, the extensor tendons of the thumb, which were much contracted, were lengthened. The hand and thumb could then be extended nearly to their normal positions. After the edges of the skin were stitched there were two irregular defects in the skin, one 2½ by 1 inch and the other about 1 by ¾ inch. These were filled in with Wolfe grafts, which were stitched into position with fine silk and dressed in the ordinary way.

May 11. First change of dressing. Grafts look well; bluish in color. Only slight discharge in the gauze.

May 20. Thumb in good position. Grafts have held firmly.

May 26. Sent from hospital on account of whooping-cough.

September 16. The thumb was found to be in good position and has several degrees of voluntary motion; the hand was still slightly flexed on the forearm. A cicatricial band was therefore divided and a graft, 2 by 1 inch, inserted on the flexor side of the forearm. The scar tissue was also dissected off from the proximal interphalangeal joint of the ring finger and a graft, 1¼ by 1 inch, inserted there.

October 10. These were entirely healed.

October 18. Little finger amputated, consent having been withheld before. After the healing of this wound she was treated by massage and her hand continually improved, but on January 5th, as there was considerable ulnar deflection of the hand, the cicatrix of that side of the wrist was incised, a part of it dissected away and a graft, 1½ by ¾ inch, was inserted. This held well, and massage was again used; but on June 28th, as there was still some ulnar deflection, another incision and dissection were made and a diamond-shaped graft, 2 by 1 inch, was inserted. This was well healed in place in five weeks and the patient sent home. The accompanying photographs were taken two and a half months later and show the deformity well corrected.

CASE III.—E. C., History No. 1664, aged 12 years, July 26, 1904. Hand was burned when he was a small child and a contraction has followed. The terminal phalanx of the left index finger is drawn forward, almost to a right angle, and held by dense scar tissue. The middle and terminal phalanges of the little finger are flexed upon the proximal phalanx which in turn is held backward toward the dorsum of the hand by firm cicatricial bands. (See photograph.)

Operation July 29th. Cicatricial tissue excised from flexor side of both fingers, deep tendon of index finger and superficial tendon of little finger lengthened. Grafts sewed in with catgut. Dressed in usual way.

First dressing changed August 6. Wound clean. Grafts look grayish-white.

August 20. Dressing changed: grafts have taken, excepting small area at the end of the one on the little finger.

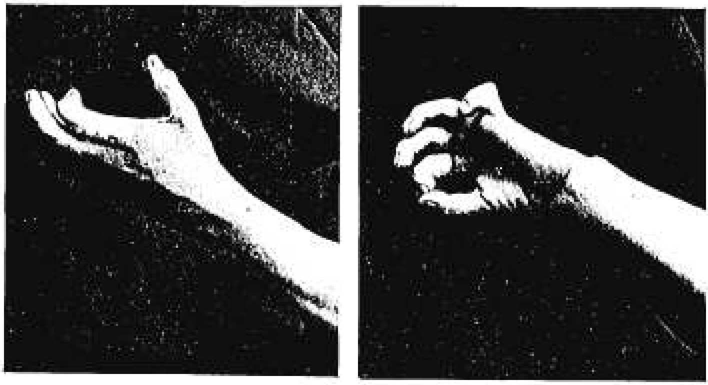
September 3. A slight granulating spot at margin of little finger graft.

October 8. Discharged cured.

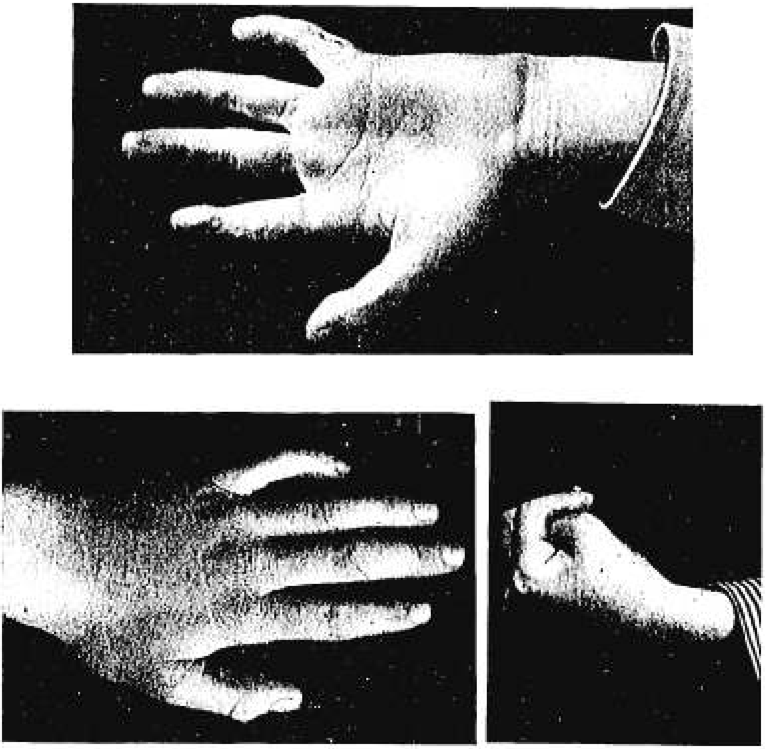
November 8, 1905. Presented before New York Surgical Society. Hand useful and shows hardly any practical disability. Extension of both fingers almost normal. Flexion in both little and index fingers about ⅔ the normal. No voluntary motion in terminal joint of index finger. (See photographs.)

CASE IV.—M. C. (History No. 1965), aged four and one-quarter years. April 4, 1905. Three years ago (when sixteen months old) fell and cut palm of hand and base of index finger on glass. A contracture followed, which increased for a few months and has since been stationary (see photograph). The right index finger was found flexed at the proximal interphalangeal joint, and held by a firm cicatricial band which extended well into the palm. There were several degrees of motion at the metacarpo-phalangeal joint.

Plate III. (Case III.)



Figs. 1 and 2.—Cicatricial Contractures of Index and Little Fingers of about ten years duration.



Figs. 3, 4, and 5.—Photographs of Hand in Extension and Flexion one year after operation.

Plate IV. (Case IV.)

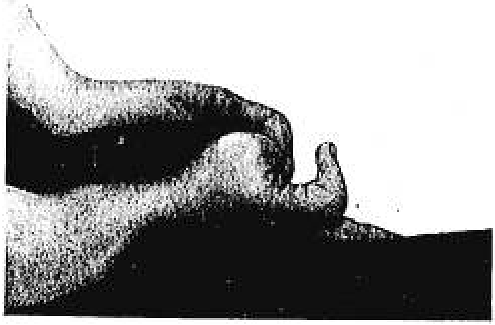
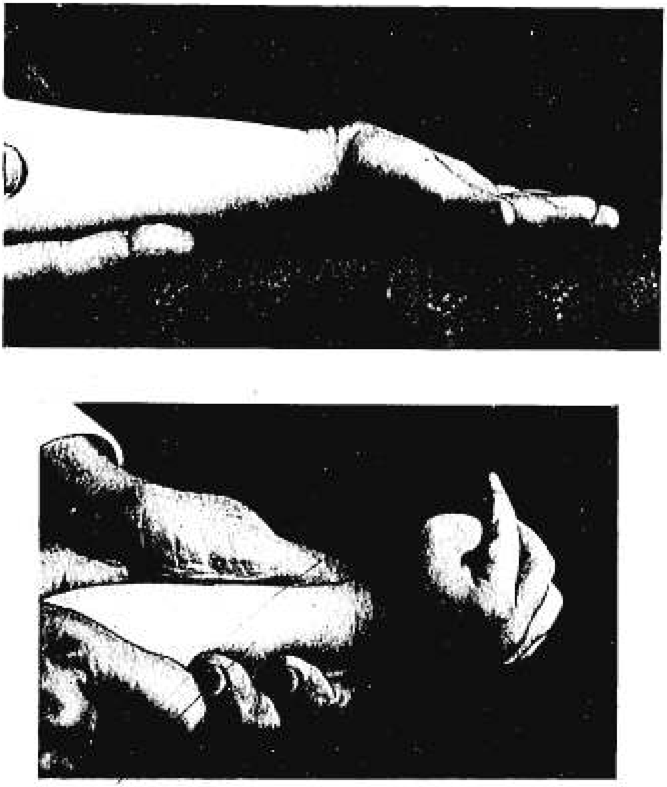


Fig. 1.—Contracture of Index Finger of three years duration.



Figs. 2 and 3.—Hand in Extension. Flexion, six months after operation.

April 6, 1905. Cicatricial tissue dissected out. Just under the skin it was very firm and band-like. An elliptical graft, 1¼ by ¾ inch in size, was stitched into the defect. Nine days later dressing changed for first time; condition of graft good. Seven days again dressed; doing well. One month after operation graft of good color and firm. Three weeks later discharged with graft firm and several degrees of motion in finger.

Seen October 21, 1905. Finger held extended; no contracture (see photograph). She can flex it to a right angle, and when she does so the tendon can be felt in the palm and at the base of the finger. It is, however, adherent in the proximal phalanx of the finger, and gives no independent motion in the distal and middle phalanges.

Case V.—S. C. (History No. 1838), aged seventeen years, congenital deformity of hands. (See photograph.)

February 16, 1905. Left little finger. The very dense band of fibrous tissue, which resembled that of the other cases, was dissected away and the finger straightened. A skin graft, 2½ by 1¼ inches, was stitched into the defect and the usual dressing applied, with the finger in extension.

February 27. First dressing; doing well.

March 1. Second dressing; doing well.

March 3. Third dressing. Patient discharged from hospital, to be dressed by Dr. George W. Kosmak, who sent her there.

May 18. This finger was found to be nearly straight, with slight flexion at the terminal joint; held in slight adduction, ten to fifteen degrees of motion in each joint.

Operation May 18 on right little finger. Operation similar to that on left side. Two grafts were used; one kite-shaped, 2 by 1 inch, and one of irregular shape, ½ by ¼ inch. First dressing, eleven days later; graft dry and clean, position of finger good. Patient referred to Dr. Kosmak for further dressing. Healing took place well. No other operation was deemed advisable, excepting the removal of the terminal phalanx of one of the fingers. The contractures were relieved and the healing of the grafts was satisfactory, but on account of the congenital defects, the resulting fingers were far from normal.

Case VI.—J. N. (History No. 2100), aged seven years.

March 20, 1905. One year ago clothing caught fire and she was severely burned about the chest and left arm. The areas about the upper arm and chest were covered partly by a flap taken from the side of chest, and partly by Thiersch grafts, but the elbow was held flexed at a right angle by contractures which had formed in the early process of healing. (See photograph.)

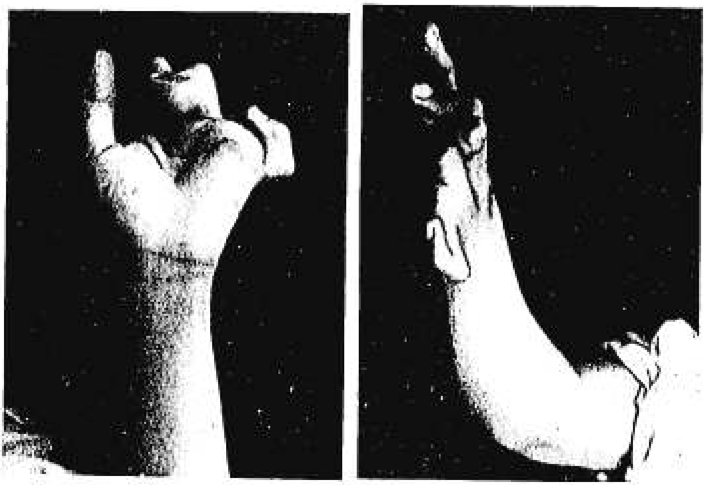
June 26, 1905. A transverse cut was made at the flexor surface of the elbow and the skin was loosened about its edge. The arm was then extended. The resulting defect, 2 by 2½ inches, was filled by a skin graft and dressed in the usual way. It was dressed eight days later, the graft showing the ordinary pale bluish color for that period of healing. One week later color good. A slight necrotic spot developed in the centre of the graft and a small spot of granulation at its edge. These were slow in healing as it was difficult to prevent the irritation of the forming scabs, even through the dressing.

She was however discharged from the hospital five weeks later in good condition and with good power of extension in the arm.

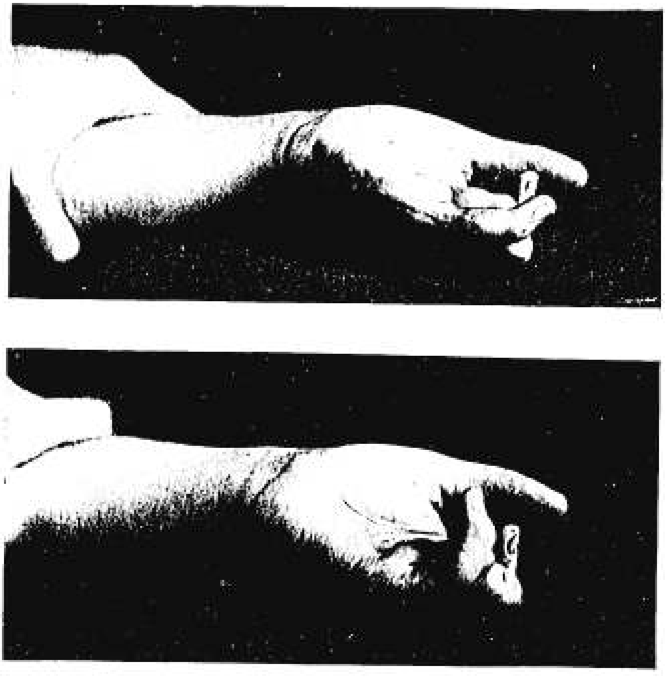
Seen four months after the operation: slight keloid about the edge of the graft and in a spot in its centre, but the skin is of good quality and firm and motion in elbow is normal.

In review we note that in the five traumatic cases the contractures were relieved and showed no tendency to recur after periods of, respectively, thirty-three, eighteen, fifteen, seven and four months from the times of the first operations. In the congenital case only the little fingers were susceptible of treatment, and these were greatly benefited. The left one, which was contracted backward so as to be not only useless, but an obstacle to the use of the hand, was changed to nearly a normal position, has several degrees of motion in each joint and is a useful member. The right one has been released from its constriction and might well have good motion, but for the congenital malposition of the parts. The grafts were all movable over the underlying tissues. Sensation was present in them; in some instances minute hairs were growing in them, and the skin was almost normal. There was a tendency to thick-

PLATE V. (CASE V.)



FIGS. 1 and 2.—Congenital Deformity of Hand.



FIGS. 3 and 4.—Little Finger in Extension and Flexion. Eight months after operation.

PLATE VI. (CASE VI.)

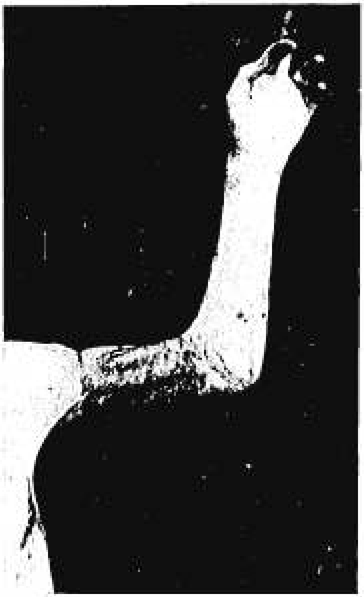


FIG. 1.—Cicatricial Contracture of Elbow. Extension limited to about 90°.

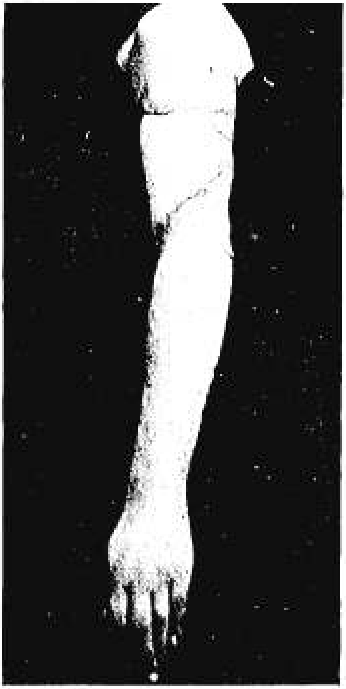


FIG. 2.—Arm four months after operation; motion in Elbow normal.

ened scar formation about their margins in varying degrees, and in one case this extended into the substance of the graft, but in no instance was this enough to interfere with the free use of the adjacent joint.

The value of tendon lengthening also is of interest. It was done six times in this series: One deep flexor of ring finger at terminal joint. One extensor ossis metacarpi pollicis. One extensor prima internodii pollicis. One extensor secundi internodii pollicis. One deep flexor of index finger. One superficial flexor of little finger.

In the first case the resulting motion was practically normal. In the extensors of the thumb the resulting motion was about half the normal, limitation in extension being apparently due to a cicatricial band in the middle of the wrist and palm, which had not been sufficiently divided. The result for the superficial flexor of the little finger was apparently good; but it was difficult to distinguish the action of the deep and superficial tendons. In the last instance the lack of voluntary motion in the terminal joint indicated that the lengthened tendon was so adherent as to give no independent motion.

These results are surely sufficiently good to warrant the further trial of these two elements in relieving these contractures. They are surely much better than the author has seen from other methods.

In estimating the value of the procedure, we must manifestly consider the difficulty in securing union in the grafts. This difficulty has been sufficient to make the "entire skin" method of grafting unpopular. With the small grafts which are usually needed for contractures, however, and the clean surface which can be obtained, there is little difficulty in obtaining union. In this series every graft held well. If we include in the series a failure of a graft in a contracted ankle, where an ulcer was present and the tissues were very poorly nourished we still have ninety-three per cent. of successes. Operation for these cicatricial contractures can almost always be done in well nourished tissues, and without the presence of ulceration, and we may confidently expect the graft to hold in almost every instance.

Technique.—There are some points about the technique which are important. Aseptic operation without the use of germicidal solutions is desirable; also hæmostasis, when possible by pressure, without the use of ligatures. The grafts may be held in position by small silk stitches, although Krause considers this unnecessary.

The method of dressing has varied greatly with different operators. Kennedy in one instance left the first dressing of sterilized gauze in place five weeks, healing being complete on its removal. Wolfe, whose operations were on the face, usually changed the first dressing on the third day and then made daily dressings. Krause changes his first dressing in three or four days and dressed the wounds again every two or three days, soaking off the gauze with boracic acid solution immersing the entire member in the solution for about an hour. Of course the method must differ somewhat with the case. Cleanliness and fixation are the two desired conditions. If there is doubt about the former, the dressing would be changed oftener than if asepsis is assured. The nourishment of the graft takes place by effusion at first, and then minute vessels have been observed running into the graft itself, in some instances communicating with those vessels which already existed there. It is important that the grafts should not be moved, as these vessels are of course very delicate indeed. It is difficult to avoid moving the grafts in changing the dressing, and therefore great care must be used. In the cases here reported rubber tissue has been put over the graft and allowed to extend about a quarter of an inch beyond its margin on all sides. Moist gauze has been placed above this, which is also protected by rubber tissue to prevent its too rapid drying, and this has been enveloped in dry sterile gauze. The part has usually been put in plaster, and the first dressing has been done eight to fourteen days later. If there is a purulent discharge, it can quickly be told by the odor, a part of the gauze being left uncovered by the plaster for this purpose. The first rubber tissue is usually not changed at the first dressing; if changed it has been replaced by a similar one. One can easily appreciate the advantage of Krause's method, which consists in soaking the entire member for an hour in boracic acid solution until the gauze is entirely loosened from the graft; but many of these contractures occur in children, and it would be practically impossible to follow this method with them without having the graft injured.

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[1] Brit. Med. Jour. September 1875, p. 360.
[2] Archiv. f. klin. Chir., 93, xlvi, p. 177-182.
[3] Henle and Wagner. Beiträg. zur klin Chir. Bd. xxiv, Hft. 1.
[4] Widman. Beiträg. zur klin. Chir., Bd. xxxvi, p. 579-1902.
[5] Kennedy. Glasgow Hospital Reports, 1899.
[6] Hibbs. Med. News, April 21, 1900.